

Stormwater Management Program

Effectiveness Literature Review

Source Control

Prepared for:
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Washington State Dept. of Ecology

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Methods

Ranked Questions guided the literature review

Ranked questions fall in four source control topics:

1. Construction source control BMPs
2. Source control at private stormwater facilities
3. Illicit Discharge Detection and Elimination (IDDE)
4. Business Inspections as source control

Information sources used:

1. Publications from citations in Effectiveness Literature database
2. Additional publications not in database
3. Publications were a mix of primary peer-reviewed literature, guidance manuals, government gray literature, books, and public education flyers and factsheets.
4. Personal experience with source control, business inspections, and source tracing.



Construction Source Control

Ranked Question: Are the temporary erosion and sediment control (TESC) BMPs required during development or redevelopment adequate to control erosion and sediment from construction sites?

Answer: Yes, but...

- > depends on BMP selection, implementation, maintenance, and combination with other BMPs.
- > soil characteristics, climate, and site conditions can affect effectiveness of BMPs.

Literature: Limited coverage of construction BMPs in effectiveness literature .

*The most effective: Polyacrylamide (PAM) application to soils and/or other BMPs:
Fiber check dams, compost blankets and filter socks, wood mulch blankets.*



Fiber check dams at a construction site (a.k.a. straw wattles, coir logs).

From McLaughlin and Jennings (2009). North Carolina.

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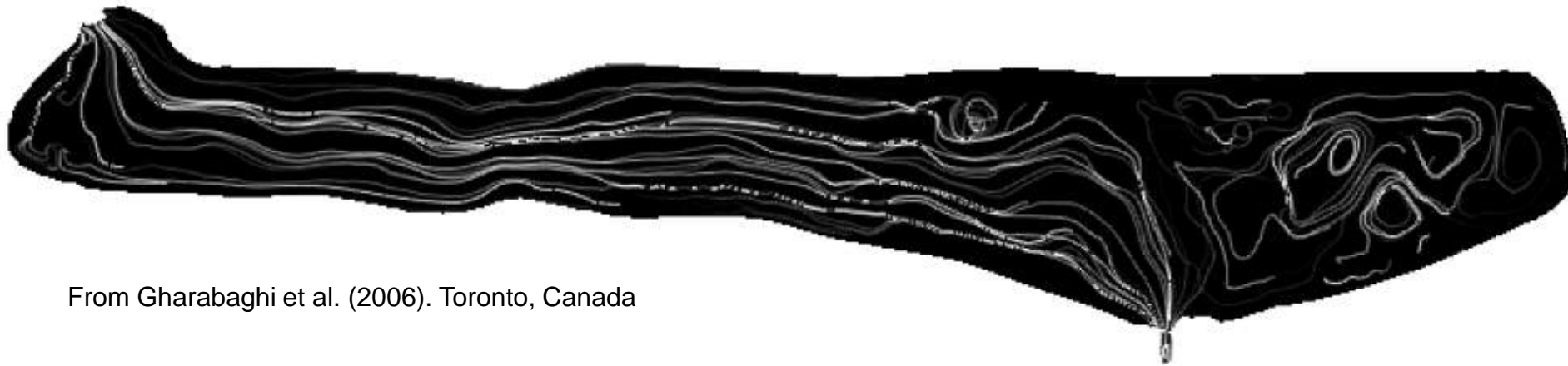
Literature: Limited coverage of construction BMPs in effectiveness literature .

The most effective: Polyacrylamide (PAM) application to soils and/or other BMPs:
Fiber check dams, compost blankets and filter socks, wood mulch blankets.

Less effective: PAM application to straw blankets, use of geotextiles.

The least effective: plain straw, plain fiber blankets, sedimentation ponds.

Flow trace analysis in a sediment pond.



From Gharabaghi et al. (2006). Toronto, Canada

Sediment removal efficiency: 15%

Construction Source Control

Ranked Question: Are the TESC BMPs used at construction sites effective at reducing turbidity/TSS for compliance with water quality standards?

Answer: Yes, but compliance level discharge typically achieved with use of treatment BMPs, such as chemical treatment or intensive filtration.

Background turbidity	<50 NTU	>50 NTU
Standard	5-10 NTU over background	10-20% over background
From 173-201A WAC		

Literature: Limited information available in studies in effectiveness literature.

High percentage reduction in turbidity and TSS often cited in literature but in relation to no treatment at all.

Most studies were controlled experiments and not results from construction sites.



Construction Source Control

Ranked Question: What frequency of construction erosion and sediment control inspections are most effective for achieving compliance with codes/ordinance requirements at new development and redevelopment project sites?

Answer: Not addressed in effectiveness literature.

Private Stormwater Facility Source Control

Ranked Question: Do more frequent site visits and contact with private facility owners improve compliance with operation and maintenance (O&M) requirements?

Answer: Yes. But few publications were available.

Literature:

Kitsap County

Successful program of reducing bacterial pollution to Dyes Inlet.

Inspection frequency increased from every 2 years to annually.

Behavioral changes related to pollution prevention usually short-lived without reinforcement.

Distinction between change in behavior and increased knowledge about pollution prevention.



Private Stormwater Facility Source Control

Ranked Question: What is the optimum frequency of inspections to maintain the functionality of private stormwater facilities?

Answer: Not addressed in effectiveness literature.

Question requires defining the range and variety of private stormwater facilities and searching for literature about them.

Frequency of inspection is related to the type of BMP (e.g. sediment pond vs. rain garden).

Illicit Discharge Detection and Elimination

Ranked Question: Which combination of methods work best for detection of illicit connections: smoke testing, dye testing, CCTV, flow monitoring and outfall screening (wet and dry season)?

Answer: Not addressed in effectiveness literature. Method selection depends on foreknowledge of potential source.

Literature:

Most effective methods from survey of NPDES permittees in Washington:

- IDDE hotline

- Inspections of manholes and catch basins

- Inspections of outfalls

Forthcoming IDDE field screening manual (King County and WA Stormwater Center) will provide guidance specific to western Washington.



Illicit Discharge Detection and Elimination

Ranked Question: How effective is wet weather screening as a tool to detect illicit connections?

Answer: Not addressed in effectiveness literature. Method selection depends on some foreknowledge of potential source.

Literature:

Forthcoming SIDIR project will provide information resource for permittees to share knowledge and develop an chemical indicators database.



Illicit Discharge Detection and Elimination

Ranked Question: Which parameters should be measured during dry weather screening to improve the ability to detect illicit connections?

Answer: Not addressed in effectiveness literature. Method selection depends on some foreknowledge of potential source.

Literature:

Several western Washington permittees have already developed dry weather screening manuals, including City of Seattle, Snohomish County, and City of Bainbridge Island.

Outfall screening during dry weather to look for algal growth, discolored discharge, odorous discharge, or deposition patterns.



Business Inspections

Ranked Question: Are businesses that receive an in-person visit/inspection more likely to implement source control BMPs?

Answer: Not addressed in effectiveness literature.

Experience: Yes. Sometimes a business inspection results in immediate change to the proper usage of a BMP.

Prioritize businesses where staff or management changes frequently.
e.g. restaurants, large box stores and hardware stores, some automotive businesses (carwashes, detailers, mobile auto repair/detail).

Behavioral question.

Business Inspections

Ranked Question: What frequency of business inspections is most effective for implementing and maintaining source control requirements/BMPs at businesses?

Answer: Not well addressed in effectiveness literature.

Literature:

Kitsap County

Successful program of reducing bacterial pollution to Dyes Inlet.

Inspection frequency increased from every 2 years to annually.

Experience: Structural BMPs – custom inspection frequency for each BMP type.

Non-structural BMPs - key is regular contact

- management/staff/owners change
- build relationships

Recommended Source Control Effectiveness Studies

Find literature or study the effects of PAM with Puget Sound basin soils.

- > Many of the studies in the effectiveness literature database were from the American southeast (Coastal Piedmont), which has notably different soil characteristics than soils in the Puget Sound region, which are dominated by glacial deposits and glacial outwash soils and lower clay content.

Study the success of construction BMPs under real construction conditions.

- > Include multiple and varied BMPs - source control and treatment BMPs - as a better reflection of on-the-ground treatment at construction sites.

Review sediment pond design in the SWMMWW.

- > Use the Universal Soil Loss Equation or another appropriate model to estimate sediment loading to a sedimentation pond.

Find literature or study how inspections of business and private stormwater facilities relate to the facilities' O&M requirements.

Expand the effectiveness literature database.

- > Include more publications related to the questions asked.